Technical Justification Summary

Attachment 7 consists of the following items:

- ✓ **Technical Justification.** Attachment 7 provides the technical justification for each of the proposed projects.

The physical benefits are summarized and used to highlight the relationships between all of the Proposal's projects in **Table 7-1**. Individual technical justification sections follow that provide information on the without project scenario, physical benefits, uncertainties, facilities or permits required to obtain benefits, potential adverse impacts, and annualized benefits.

Table 7-1: Project Physical Benefit Summary

#	Project	Physical Benefit	Amount
1	**Recycled Water and Plant Material Conversion Project for HOA Common Areas**	Water supply	43 acre-feet per year (AFY) of potable water offset through water use efficiency and recycled water use
		Energy use and greenhouse gas (GHG) reduction	138 megawatt hours per year (MWh/Y) of energy offset and 49 metric tons (MT) of GHG emission reductions
2	**Native Botanical Garden Project**	Water supply	4 AFY of water supply offset through demonstration garden education on water use efficiency and native plant use
		Habitat and Recreation	0.5 acre of increased habitat and recreation are for the Anza Valley Disadvantaged community (DAC)
3	**Upper Valle de Los Caballos Recharge Project**	Water supply	5,417 AFY of treated imported water offset and 5,417 AFY of local recharge and recovery of untreated water
Interregional Project (joint project with San Diego IRWM Region; Att7 complete narrative included in San Diego IRWM grant application)			
4	**Implementing Nutrient Management in the Santa Margarita River Watershed – Phase II**	Water quality	Improve scientific knowledge of SMR Watershed; avoid municipal stormwater treatment facility through 245,000 lbs nitrogen and 25,000 lbs Total P reduction; and nutrient management to remove streams from 303(d) list
		Stakeholder involvement	14 Stakeholder Advisory Group meetings to provide input into Nutrient Assessment

Recycled Water and Plant Material Conversion Project for HOA Common Areas

Project Description

The Recycled Water and Plant Material Conversion Project (RWPMC Project) for Home Owner Association (HOA) Common Areas is proposed for funding by Rancho California Water District (RCWD) in partnership with Metropolitan Water District of Southern California (MWD), Eastern Municipal Water District (EMWD), Rainbow Canyon HOA, Meadowview HOA, and Paloma Del Sol HOA. The RWPMC Project seeks to offset current potable supply used for the irrigation of common areas at the Rainbow Canyon, Meadowview Community and the Paloma Del Sol HOAs within RCWD's service area. The RWPMC Project will consist of the following activities:

- Conversion of existing potable-water irrigation systems to efficient recycled water systems (i.e. installation of drip components, high efficiency nozzles, and smart irrigation controllers)
- Hot-tapping of RCWD's recycled water mainline to accommodate use of recycled water at the conversion sites
- Replacement of existing high water use plant materials with drought tolerant and aesthetically pleasing California friendly/native plants.
- Public outreach (i.e. workshops and site signage) to demonstrate to the local community the benefits of the HOA irrigation system retrofits and use of California friendly/native landscapes, and to promote the importance of recycled water use.

Without Project Description

RCWD currently relies on imported water from MWD to meet close to 60% of its total water demand for a customer population of approximately 136,000. Groundwater and other local sources account for about 33% of total supplies, while recycled water currently provides about 10%. MWD provides imported water to RCWD through EMWD by extracting supplies from both the Sacramento-San Joaquin Delta (Delta) and the Colorado River.

If the Project is not implemented, the three HOA sites will continue to use about 43 AFY of Treated Tier 2 MWD potable water for irrigation. Since Treated Tier 2 MWD water is the most expensive supply used by RCWD to meet demand, it is considered to be the marginal source of potable water for RCWD. Project implementation will avoid the need to purchase 43 AFY of Treated Tier 2 imported water, or 1,290 AF over the assumed 30-year life of the project.

RCWD currently receives 2,017 AFY from the Temecula Valley Regional Water Reclamation Facility (TVRWRF), owned and operated by EMWD, and has the contractual right, if it develops facilities to utilize additional recycled water, to receive up to an additional 3,586 AFY. Currently, when there is not enough demand, the effluent from the TVRWRF is discharged to Temescal Creek, which ultimately enters the Pacific Ocean via the Santa Ana River. If the Project is not implemented, the 29 AFY of recycled water that could be used to its highest beneficial use (such as irrigation supply) will continue to be discharged into Temescal Creek and wasted.

Without the project, the imported water demand will remain the same as will the greenhouse gas (GHG) emissions created during the pumping, conveyance and treatment of that supply. Since there will be energy required to supply the recycled water in lieu of treated imported water, it is subtracted resulting in a net 138 MWh/Y of energy that will be consumed and 49 Metric Tons (MT) of CO2 (a GHG) would be emitted without the Project.

Without this project, over irrigation of landscaped areas will continue to produce dry-weather runoff into local water bodies such as Temecula and Murrieta Creeks and travel downstream to the Santa Margarita River, and the Santa Margarita Lagoon, which are all 303(d) listed water bodies for non-point and point sources. No other water quality improvement project is planned to limit the sources of supply; limiting dry weather flows is the only method currently available to minimize contaminant loading.

Project Physical Benefits

This section describes both the quantitative and qualitative physical benefits that are claimed for the Project. These quantifiable physical benefits are summarized in **Table 7-2** with narrative explanations organized by benefit type. The qualitative benefits of the Project are described in Attachment 8.

Table 7-2: Summarized Project Benefits

Physical Benefit	Units/Y	Technical Justification
Water Supply – offset imported supply through water use efficiency and recycled water use	43 AFY Imported offset 14 AFY Water use efficiency 29 AFY Recycled water use	***2010 Urban Water Management Plan, RCWD 2011:*** Provides documentation of the claim that Treated Tier 2 imported water is and will be used, and available for offset through 2035. Also documents RCWD's need and desire to meet 20x2020 through both water use efficiency and recycled water offset of potable supplies. **(Appendix E)** ***Water Audit and Area Report For Rainbow Canyon HOA,*** **Adams Landscaping, 2011:** Provides the assessment of conservation potential at the Rainbow Canyon Site if the existing irrigation system and landscaping is replaced with Project components. This provided the basis for estimating conservation potential at the other two Project sites. **(Appendix E)** ***New Water Demand Offset Program Data Collection and Estimate of Average Conversion Cost,*** **RCWD 2009:** Provides the basis for determining potential for recycled water use at the sites throughout RCWD's service area. **(Appendix C)**
Energy Conservation - reduced energy from offset of SWP water	138 MWh/Y	**Refining Estimates of Water Related Energy Use in California, California Energy Commission, 2006:** Provided the basis for energy use associated with both imported water and recycled water. **(Appendix E)**
Greenhouse Gas Reduction - reduced emissions	49 MT of $CO_{2(equivalents)}$/Y of GHGs	***US EPA eGrid data:*** **http://www.epa.gov/cleanenergy/documents /egridzips/ eGRID2012V1_0_year09_GHGOutputrates.pdf:** Provided the basis for the carbon emissions rate used. **(Appendix E)** **Energy Almanac. California Electrical Energy Generation, 1997 to 2011, Total Production, by Resource Type: http://energyalmanac.ca.gov/electricity/electricity_generation.html.** Accessed March 2013**, California Energy Commission, 2011.** Provided the basis for the mix of energy sources in California. **(Appendix E)**

Water Supply

The primary benefit of the Project is to offset the current use of treated imported water from the Delta and the Colorado River, supplied by the MWD through both EMWD and WMWD. The

project sites combined use equals an average of 43 AFY of potable supply that can be reduced to 0 AFY through the implementation of this Project.

Currently, RCWD uses imported supply to meet over 60% of its water needs. Recently, the 2007-2009 drought resulted in water shortages and heightened awareness of reducing dependence on imported water and from regulatory actions and court decisions that have reduced exports from the Delta. According to RCWD's 2010 Urban Water Management Plan (UWMP), MWD's State Water Project (SWP) supplies will be impacted by 1) a significant restriction on Bay-Delta pumping, as required by the biological opinions issued by the U.S. Fish and Wildlife Service (in December 2008) and the National Marine Fisheries Service (in June 2009); and 2) climate change, which is altering hydrologic conditions in the state. Thus, RCWD has made it a goal to reduce its dependency on imported water which will increase projected supply reliability. This goal can be accomplished through the better utilization of local water supplies and improvement of the overall water use efficiency of its customers.

This total imported water offset of 43 AFY benefit will be achieved through implementing two Project strategies:

- **Increasing Water Use Efficiency:** The Project will remove nearly two acres of turf and improve existing irrigation system efficiency will lead to a decrease in the sites combined 43 AFY water requirement by 14 AFY. The project will reduce total water consumption at the three project sites by 14 AFY or 34 percent[1] (from the existing annual average of 43 AFY to 29 AFY) through irrigation system retrofits and plant material replacement. Total saving will be 420 AF over the 30-year life of the project.
- **Increasing Recycled Water Use:** The new irrigation system installed will be used to supply locally produced recycled water instead of treated potable supply. The total recycled water used at the three sites will be the 29 AFY required to meet the projected demand of the new landscaping at the Project sites. Total saving will be 870 AF over the 30-year life of the project. A secondary benefit to using recycled water to offset imported supply is that recycled water currently being produced will be able to be used to its higher value as irrigation supply instead of being wasted as discharge to the Temescal Creek.

[1] The average efficiency percentage among sprinkler irrigation systems is approximately 63%. The RWPMC Project will increase efficiency to approximately 80%. This 17% increase in system efficiency results in 34% decrease in irrigation water use.

The benefit numbers described above were derived from the result of calculations and studies conducted by RCWD as described below. The potential for annual water savings at all three sites is provided in **Table 7-3.**

Table 7-3: Estimated Average Annual Water savings at 3 Participating Project Sites

Annual Consumption By Year (AF)						
Site	**2012**	**2011**	**2010**	**2009**	**2008**	**Average**
Meadowview	15	13	15	15	13	14
Paloma Del Sol	22	15	16	18	14	16
Rainbow Canyon	11	10	12	16	20	13
TOTAL	**48**	**38**	**43**	**49**	**47**	**43**

Initial Estimates for Water Conservation Potential: The potential for irrigation requirements at the project sites were determined by applying the following equation to generate the results shown in **Table 7-4**.

((ETo x Kl X IA)/DU) /522,720 = Acre feet of water required

ETo	=	Evapotranspiration (inches)
Kl	=	Landscape Coefficient (%)
IA	=	Irrigated Area (square feet)
DU	=	Distribution Uniformity (%)
522,720	=	Converts inches of water to acre feet

Table 7-4: Pre-and Post Project Water Demand Calculations

	ETo	**Kl**	**IA**	**DU**	**Conversion Factor**	**Water Requirement (AFY)**
Pre-Conversion	50	0.6	500,000	0.67	522,720	43
Post-Conversion	50	0.48	500,000	0.8	522,720	29
					DIFFERENCE	**14**

Water Audit and Area Report For Rainbow Canyon HOA, Adams Landscaping, 2011**:** Catch Can tests were performed to determine distribution uniformity and precipitation rates (see **Appendix C**). Distribution uniformity (DU) directly influences the amount of water required to

keep the landscape green. Precipitation rate (PR) is the amount of water emitted from an irrigation system measured in inches/hour. A general Irrigation Efficiency (IE) analysis was given of approximately 75% due the amount of overspray onto the trail area and fences. The results of the analysis showed that by converting the turf areas to low water use planters in conjunction with a drip emission system, and designing the remaining turf to optimize the overhead irrigation, and alleviating the trail/fence overspray, the property could effectively reduce the total property water requirement.

New Water Demand Offset Program Data Collection and Estimate of Average Conversion Cost, RCWD 2009: Given that RCWD does not currently use all of its recycled water potential allocations, this program was developed to expand the demand on RCWD recycled water by evaluating potential potable irrigation customers for conversion to a recycled water system within 500 feet of the existing recycled water system. It specifically evaluated the potential for recycled water use at the applicable HOA common areas based on residential tenants and/or owners, number of meters and public access and proximity of HOA common facilities to private residences and landscaping. The resulting analysis determined that the Project's HOA common areas provide strong options for Project implementation (see **Appendix C**).

Energy Conservation and Greenhouse Gas Emissions

According to the 2006 *Refining Estimates of Water Related Energy Use in California* by the California Energy Commission, conveyance of 1 AF of imported water to Southern California requires about 3,170 kWh[2], on average, with an additional 36 kWh/AF necessary for treatment. Since the EMWD treats all wastewater collected at the TVRWRF to tertiary standards, there are essentially no additional energy requirements associated with the treatment of recycled water, compared to the "without project" scenario. Thus, it is assumed that imported water requires 3,206 more KWh (3,170 kWh/AF + 36 kWh/AF, or 3.2 MWh) per AF for conveyance and treatment, compared to the local water supplies generated by this project.

[2] Although RCWD receives imported water from both the State Water Project (SWP) and the Colorado River, SWP water is the most expensive and energy intensive source of water for MWD to provide. Thus, recycled water is assumed to offset SWP water and estimates for energy use reflect this.

The distribution of 29 AFY of recycled water requires about the same amount of energy as the distribution of 43 AFY of potable water (because the TVRWRF is located at a lower elevation than RCWD potable water supplies)[3], thus, there will be no avoided energy use associated with local distribution of supplies if this project is implemented.

Electricity used in California is generated within three different energy subregions (known as Western Electricity Coordinating Council, WECC, subregions): California, the Northwest, and the Southwest (California Energy Commission, CEC, 2011). Almost 70% of California's electricity is generated within the state (CAL). The approximate breakdown of California's major sources of electricity is as follows: 45% is provided by natural gas, 18% is provided by nuclear power, 21% is provided by hydroelectric plants, 2% is provided by coal-fired power plants, and 14% comes from renewable sources (CEC, 2011).

CO_2 emissions resulting from the production of electricity, measured as tons of CO_2 per MWh, vary by energy source (e.g., hydropower, natural gas, etc.). As detailed above, in California, electricity production relies on a range of energy sources, including those located within California and those located outside of the state. Based on the current mix of energy sources for California, the CO_2 emissions rate for energy used to transport imported water is estimated to be 0.354 MT/MWh. To calculate energy savings associated with the project, we first multiplied the amount of energy required to transport and treat 1 AF of imported water (3.2 MWh/AF) by the amount of imported water that will be avoided as a result of the project (43 AFY at full implementation).

To calculate the CO_2 emissions rate associated with energy use in California, we relied on 2009 EPA eGrid data. As noted above, the CEC (2011) reports that 70% of electricity used in California is generated in-state, 20% is generated in the WECC Southwest subregion, and 10% is generated in the WECC Northwest subregion. EPA publishes average CO_2 emissions rates for these subregions based on the various energy sources used to generate electricity within them (i.e., natural gas, hydropower, etc.). **Table 7-5** shows the CO_2 emissions rate for the three regions that produce the electricity used in California, and the average weighted rate for electricity used within the state. It is assumed that the mix of energy sources used by the state overall is representative of the mix of energy sources used to import water to RCWD.

[3] Although recycled water distribution uses a bit more energy compared to potable water distribution due to the TVRWRF being located at a lower elevation, with the project, RCWD will only be distributing 29 AFY of recycled water, compared to 43 AFY without the project. Due to the reduced amount of water being distributed with the project, energy requirements associated with distribution with and without the project are essentially equal (within 2.03 MWh per year).

Table 7-5: CO_2 Emissions Rates

WECC region	Emissions rate (MT/MWh)	Percent of California electricity use
California	0.299	70%
Southwest	0.540	20%
Northwest	0.372	10%
Weighted average emissions rate for electricity used in California	**0.354**	

Source: U.S. EPA eGrid data:
http://www.epa.gov/cleanenergy/documents/egridzips/eGRID2012V1_0_year09_GHGOutputrates.pdf

Given the calculated weighted average CO_2 emissions rate of 0.354 MT of CO_2 emitted per MWh, 1.13 MT of CO_2 are produced for every AF of imported water delivered to RCWD (3.2 MWh/AF multiplied by 0.354 MT/MWh). By eliminating use of 43 AFY of imported water (at full implementation), the project will avoid emissions of close to 49 MT of CO_2 per year.

At full implementation, the project will result in a net energy savings of 138 MWh per year and a net reduction in CO_2 emissions of 49 MT per year. Given the schedule for project construction (with some benefits beginning to accrue in 2013), the Project will result in a net energy savings of 4,135 MWh and a net CO_2 emissions reduction of 1,464 MT over the 30-year project life.

Uncertainties

The potential for water conservation savings as a result of implementing the Project are based on conservative estimates. Audits will be completed at each Project site as part of the Project to further refine the potential for water use efficiency and recycled water supply needed. The amount of recycled water that will be needed at each site could decrease if further conservation measures are employed by the site owners. The carbon emission and energy requirement estimates used for this analysis represent California statewide averages. However, emission factors will vary based on the mix of local energy supply sources. It is uncertain whether more exact emission rates would be higher or lower for the energy used to treat and transport imported water and recycled water.

Potential Adverse Effects

There are no potential adverse physical effects that could be determined as a result of Project implementation.

Facilities, Policies and Actions Required to Obtain Benefits

There are no additional facilities, policies or actions beyond what is already described as part of the Project that will be required to obtain the benefits documented here.

Annual Project Physical Benefits

The following **Tables 7-6 through 7-8** present the physically quantifiable benefits for the Project. One table is completed for each physically quantifiable benefit.

Table 7-6: Annual Imported Water Supply Offset through Water Use Efficiency and Recycled Water Use Benefit

Type of Benefit Claimed: Offset of imported supply **Measure of Benefit Claimed (Name of Units):** AFY avoided **Additional Information About this Measure:** over the average year			
Physical Benefits (AFY)			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012	0	Not applicable	Not applicable
2013	0	2	2
2014	0	39.3	39.3
2015-2044	0	43	43

Table 7-7: Annual Imported Water Energy Use Offset through Water Use Efficiency and Recycled Water Use Benefit

Type of Benefit Claimed: Offset of imported supply energy **Measure of Benefit Claimed (Name of Units):** MWh/Y avoided **Additional Information About this Measure:** over the average year			
Physical Benefits (MWh/yr)			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012	0	Not applicable	Not applicable
2013	0	6.5	6.5
2014	0	126	126
2015-2044	0	138	138

Table 7-8: Annual Imported Water GHG Emissions Offset through Water Use Efficiency and Recycled Water Use Benefit

Type of Benefit Claimed: Offset of imported supply GHG emissions **Measure of Benefit Claimed (Name of Units):** MT/Y of Co^2 equivalent (GHG) avoided **Additional Information About this Measure:** over the average year			
Physical Benefits (MT/Co2/yr)			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012	0	Not applicable	Not applicable
2013	0	2.3	2.3
2014	0	44.6	44.6
2015-2043	0	48.8	48.8

Native Botanical Garden Project

Project Description

The Native Botanical Garden Project is proposed by the South Coast Resource Conservation and Development Council (SCRC&DC) in partnership with the Hamilton Museum, the High Country Conservancy, and the Anza Community Beautification and Garden Projects Committee. The Native Botanical Garden Project would expand an existing native plant garden at the Hamilton Museum by an additional ½ acre. The additional native botanical garden will re-vegetate the existing open space with exhibit plants that represent the local landscape and natural habitat types unique to the Anza Valley. To access the plant exhibits, a series of winding pathways will be constructed throughout the Project site garden. Each of the plant exhibits will have interpretive signs and plant identification markers installed to assist the public with selecting plant varieties to use in their own gardens and landscaping designs. The proposed Project would also install viewing benches and a covered area throughout the garden for people to sit and gather during public workshops.

The Native Botanical Garden Project seeks to improve water conservation regionally by educating and encouraging property owners to use native plants in their landscape in lieu of invasive plants that require more irrigation water to survive. The public workshops and tours will discuss the importance and habitat, water supply and water quality benefits of restoring native plants to the Region. In this way, the Native Botanical Garden can be used as an educational outreach facility to demonstrate to the public the natural beauty of native landscapes and how using drought-tolerant native plant species can help conserve water resources while enhancing the aesthetics and resource-value of the local living environment.

As an added benefit, the Native Botanical Garden Project will provide an opportunity to enhance relationships between community members, local organizations working for the benefit of the community by providing a shared community recreation area.

Although activities associated with this project including tours and workshops will be completed within 2 years, it is anticipated that additional educational and community activities will be implemented at the garden for at least a 15-year project life, and beyond.

Without Project Description

Without the Project, the Anza community will be without an educational opportunity to learn about native landscaping and the ability to conserve local water supplies. Current and new homeowners in the area will be more likely to continue to use non-native plants and turf that have significantly higher water demands on their properties. It can be assumed that limited groundwater resources will continue to be used at existing or increasing rates, without the Project, to irrigate non-native landscapes. This additional water use will increase energy

requirements associated with groundwater pumping and CO_2 emissions associated with that energy production.

Without this project no additional educational workshops, tours or plant signage concerning water wise landscaping will be available in Anza. In addition, without this project there will be ½ acre less of educational and recreation space in a community with limited resources given its DAC status.

Project Physical Benefits

This section describes the three quantitative physical benefits that are claimed for the Project. These quantifiable physical benefits are summarized in **Table 7-9** with narrative explanations organized by benefit type. The qualitative benefits of the Project are described in Attachment 8.

Table 7-9: Summarized Project Benefits

Physical Benefit	Units	Technical Justification
Water Supply – increase offset of supply through water use efficiency	4 AFY 60AF (over project life)	***Guidelines for Estimating Unmetered Landscaping Water Use*, *Federal Energy Management Program,* U.S. Department of Energy, 2010***:** Provides process for estimating, and comparing, landscape water use that was used to estimate the potential water savings for the Anza area. **(Appendix E)**
Recreation - increase and enhance recreational space for DAC area	0.5 acre	***Cost Estimate, Anza Valley Architect, 2012:*** Provides a summary of the tasks that will be required to create the recreational amenities called out for this site. **(Appendix D)**
Habitat – create native plant ecosystems that improve local habitat	0.5 acre	***What Grows Here*, CalFlora Website,2013 http://www.calflora.com:** Provided basis for native plants and Anza ecosystems. **(Appendix E)**

Water Supply

The primary benefit of the Project is to increase irrigation water use efficiency and decrease the demand for irrigation on local groundwater supply throughout the Anza Valley area.

As described in the 2007 USMW IRWM Plan, the groundwater basin in the Anza Valley area (a Disadvantaged Community (DAC)) experiences relatively heavy groundwater use and is believed to be impacted from agricultural chemicals and leaking septic tanks. Groundwater use in the Anza Valley, coupled with recent droughts, has resulted in some residential groundwater wells being unable to sustain well water draws. Such conditions have led to substantial water-related conflicts, including water rights lawsuits and resistance to new construction. The Anza Valley

does not have viable options for procuring other sources of water, and would be required to rely on expensive and unsustainable options such as hauling water into the area if local groundwater basins were to become unviable from either a water quality or water supply perspective. As such, the 2007 USMW IRWM Plan identifies "Addressing groundwater issues in the Anza DAC Area" and "Improving Outreach and Communication" as key regional issues.

The area was recently awarded Proposition 84 Round 2 Planning funding for conducting the DAC Groundwater Study in the Anza Area, as a supporting study to the USMW IRWM Plan Update, as a first step to better determine the limits and challenges of this un-adjudicated basin. Although the results of this study are not yet known, the need for this study was based upon previous limited analysis given supply reliability issues experienced by this community. Without access to back-up supplies, increasing the reliability of the limited existing supplies by decreasing demand in this area is critical. As new homeowners move into the area they frequently remove native vegetation and replace it with non-native plants that demand significantly more irrigation supply than native varieties.

The Project will educate the public about appropriate soil preparation and irrigation methods and protocols that will provide the appropriate moisture levels for native plants. This will decrease irrigation demand and increase the availability of groundwater supplies for higher use. Since the Anza Valley is considered a DAC with a low population density, educational and partnership-building activities aimed at protecting local natural resources are needed in order to promote an integrated, effective approach to valley-wide awareness and stewardship.

The method used to calculate the water supply benefit for this Project were developed from the *2010 Federal Energy Management Program Guidelines* for Estimating Unmetered Landscaping Water Use and detailed here.

- **Identify climate zone:** The Anza Area is best represented as a Desert climate zone with a peak Evapotranspiration rate of 13.03 inches per month and a peak rainfall of 0.00 inches per month.
- **Identify and compare irrigation factors:** For this Project a low landscape irrigation factor of 3.29 gallons/ft^2/year was used for native landscapes and a high landscape irrigation factor 69.62 gallons/ft^2/year was used for all other types of landscapes, including lawns. Water savings associated with converting from a high water use landscape to a low-water use landscape (i.e., native plants) is therefore 66.33 gallons/ft^2/year.

The method used to estimate the amount of landscape conversions and decreased irrigation demand as a result of the education provided through the Project is described here.

- **Assume participation:** The Project has assumed 100 adult and 100 youth participants in the workshops and tours based upon previous participation at Anza Valley community activities. It was then assumed that 50% of the adults participating in the garden workshops over the two year project implementation period (i.e., 50 people) will convert their landscape from High to Low irrigation needs.
- **Assume area of landscape conversion:** It was assumed that each of the 50 adult participants has a non-native landscaped yard of 400 ft^2 that they will convert to native landscaping – resulting in a total of 20,000 ft^2 of converted landscape.
- **Calculate water conservation savings:** The resulting water savings is 1,326,600 gallons per year (20,000 ft^2 * 66.33 gallons/ft^2/year) or about 4 AFY. Assuming each landscaped yard remains as a native landscape 15 years, the Project can be responsible for a total water savings over 19.9 million gallons (60 AF).

As landscapes are being converted by workshop attendees, they themselves become opportunities to educate neighbors and others in the community – further increasing the potential for additional conservation savings.

Recreation and Habitat Benefits

The Project will provide both a recreation and habitat benefit to the Anza Valley through the re-vegetation of the Project site with native plants, the inclusion of pathways and sitting areas to view these native plantings and informational features to educate the community on the species and ecosystems of the Anza Valley. By expanding upon an existing site at a known community resource like the Hamilton Museum, the recreational opportunities provided by this Project will also enhance (and benefit from) the existing areas adjacent to the new garden site.

Although the Anza area has a great deal of open space, very little of this area is developed to provide the community with educational and recreational facilities. Given that this area is a DAC, little to no funds are available to develop areas where the community can congregate to learn about and enjoy their cultural heritage and environment.

The Anza Valley has been impacted from non-native planting and landscaping. The existence of non-native plants has impacted both the habitat values in the area and increased irrigation needs. Re-vegetation of the 0.5 acre Project Site with native plant species will help further enhance the Anza Valley area by creating habitat areas that have been lost to development and agriculture. The Project will re-vegetate the majority of the area but will also preserve and educate about important species to the Anza Valley area that are currently on the Project site – for example, the redshank tree (Adenostoma sparsifolium), which is an important source of both food and water to small mammals including bush rabbits, and the western fence lizard.

Uncertainties

Since the project is essentially a demonstration project to influence behavior and will not derive direct conservation savings on-site, there are uncertainties associated with the potential benefits including the following.

- Number of people that will attend an educational workshop or tour
- Number of households that will change landscaping
- How long it will take to change behavior
- Number of acres of landscaping that will change
- Exact quantity of water that will be saved due to the change in landscaping

Facilities, Policies and Actions Required to Obtain Benefits

There are no additional facilities, policies or actions beyond what is already described as part of the Project that will be required to obtain the benefits documented here.

Potential Adverse Effects

There are no potential adverse physical effects that could be determined as a result of Project implementation.

Annual Project Physical Benefits

The following **Tables 7-10 though 7-12** present the physically quantifiable benefits for the Project. One table is completed for each physically quantifiable benefit.

Table 7-10: Annual Water Supply Benefit

Type of Benefit Claimed: Increase offset of groundwater supply through water use efficiency **Measure of Benefit Claimed (Name of Units):** AFY **Additional Information About this Measure:** over the average year			
Physical Benefits (AFY)			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2013	0	Not applicable	Not applicable
2014	0	2	2
2015-2028	0	4	4
Comments: *It is expected that benefits will begin to occur in 2014, one year after the first set of tours (2013) and will continue for 15 years until 2029.*			

Table 7-11: Annual Recreation Benefit

Type of Benefit Claimed: increase and enhance recreational space for DAC area **Measure of Benefit Claimed (Name of Units):** acre **Additional Information About this Measure:** None			
Physical Benefits (acres)			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2013	0	Not applicable	Not applicable
2014-2028	0	0.5	0.5
Comments: *The project will create a one-half acre garden with walkways bench's and view areas. This one-half acre recreation site will be available throughout the 15-year project life.*			

Table 7-12: Annual Habitat Benefit

Type of Benefit Claimed: Create native plant ecosystems that improve local habitat **Measure of Benefit Claimed (Name of Units):** acre **Additional Information About this Measure:** None			
Physical Benefits (acres)			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2013	0	Not applicable	Not applicable
2014-2028	0	0.5	0.5
Comments: *The project will create a native garden using native plantings. These native plantings will provide important benefits to the insects, and mammals that rely upon them.*			

Upper Valle de Los Caballos Recharge Project

Project Description

Rancho California Water District (RCWD) operates a groundwater recharge/recovery facility in the Pauba Valley known as the Valle de Los Caballos Recharge/Recovery Facility (VDCR/RF). The VDCR/RF is frequently referred to by location, with the Upper VDC being the easternmost area of the Pauba Valley. RCWD artificially recharges untreated imported water supply from Metropolitan Water District of Southern California (MWD) into this facility. Since 1999, RCWD has recharged an average of approximately 20.4 cfs (~ 15,000 AFY) of untreated imported water into five existing Upper VDC recharge ponds. Over the same period, an average of 12.0 cfs (~8,600 AFY), or 60% or recharge, has been recovered from the four (4) existing Upper VDC production wells. The remaining recharged water moves beyond the local recovery system and migrates down gradient to additional RCWD offsite production wells where the remaining recharge water is recovered offsite of the VDCR/RF.

Groundwater recharge and recovery is a critical part of RCWD's overall groundwater management and water supply strategy, and is expected to become even more critical in future years with increasing demand and increasing uncertainty in water supply reliability. As such, RCWD embarked upon a strategic plan to optimize the operation of its VDCR/RF. The *Upper VDC Conjunctive Use Optimization Study Final Report* (Optimization Study), completed in May 2012, outlines a preferred program for increasing production and optimizing recovery and recharge operations (see **Appendix C**).

The recommended groundwater recovery and recharge program, in its ultimate configuration, set forth in the Optimization Study would increase recharge rates from 20.4 cfs (~15,000 AFY) to 60 cfs (~43,000 AFY), with models indicating a 60% recovery from the VDCR/RF. The remaining 40% of the recharge will be banked in the groundwater basin and recovered for use with down gradient wells as part of a water resource management strategy.

The improvements described in this grant application for the Upper VDC Project is one component of the overall Recharge and Recovery Program outlined in the Optimization Study to improve the overall sustainability of RCWD's groundwater supply. The Upper VDC Project involves implementation of several improvements identified in Phase 2 of the Optimization Study and would increase RCWD's current groundwater recharge and recovery capacity by an additional 5,417 AFY.

These improvements include:

- Modifications to existing berms and well pad construction
- Modifications to pond discharge piping
- Construction of a new production well (Well No. 161)
- Construction of well discharge piping

Without Project Description

RCWD currently depends on imported water from the Sacramento-San Joaquin Delta and the Colorado River, supplied by the MWD and both EMWD and Western Municipal Water District (WMWD) for over 60% of its water needs. Recently, there have been significant reductions in these imported water supplies due to recent drought conditions in northern California, ongoing drought conditions in the Colorado River watershed, and from regulatory actions and court decisions that have reduced exports from the Sacramento-San Joaquin Delta. In addition, the effects of climate change may make future imported water supplies even less reliable.

Although RCWD does plan to further develop local supplies to offset imported water use, it is understood that a significant amount of imported water supply will still be needed to meet RCWD demands. As such, RCWD also needs to implement projects that will increase the reliability of that imported supply.

Without implementing the Upper VDC Project, RCWD would: (1) continue to recharge only 25 cfs (~18,000 AFY) of *untreated* imported water within the Upper VDC recharge basin with Phase I of the project complete, and (2) continue to purchase higher-priced *treated* water supplies from MWD to meet demands. Impacts that would occur under the without project scenario include:

- Projected cost savings associated with purchasing untreated imported water supplies and treating it locally would not be realized;
- The overall sustainability of RCWD's groundwater supply via increasing the amount of long-term storage available (and therefore decreasing the risk of water shortages) would not be improved;
- Access to and local control of treatment of the imported supply would not be improved;
- Potential water quality benefits from recharging a higher quality supply to help dilute degraded supplies (e.g. agricultural drainage) currently impacting the basin would not be realized; and
- The efficiency of existing facilities would not be optimized.

Project Physical Benefits

This section describes the two quantitative physical benefits that are claimed for the Project. These quantifiable physical benefits are summarized in **Table 7-13** with narrative explanations organized by benefit type. The qualitative benefits of the Project are provided in Attachment 8.

Table 7-13: Summarized Project Benefits

Physical Benefit	Units/Y	Technical Justification
Water Supply – increased basin recharge and recovery	5,417 AFY	***Upper VDC Conjunctive Use Optimization Study Final Report* (Optimization Study)*:*** Provides documentation of the claim that a new production well will increase the groundwater recharge capacity by 4.5 cfs or 3,250 AFY with remaining recharge recovered down gradient or banked. **(Appendix C)**
Water Supply - Offset treated imported water supply	5,417 AFY	***Upper VDC Conjunctive Use Optimization Study Final Report* (Optimization Study)*:*** Provides documentation that 5,417 AFY of imported treated water purchases will be offset with untreated (raw) water. **(Appendix C)**

Water Supply

Historically, about 60% of the water placed into the VDCR/RF can be directly recovered by the recovery wells located in the Upper VDC area. The Upper VDC Project will construct a new Well 161 with the capacity to recover 3,250 AFY of new untreated imported water that can now be recharged at the VDCR/RF. In order to produce the 3,250 AFY from Well 161, about 5,417 AFY of untreated imported supply will need to be recharged into the VDCR/RF.

In addition to the water produced from the new recovery Well 161, RCWD expects to recover the remaining 40% of the 5,417 AFY (or 2,167 AFY), that it cannot be recovered directly from the VDCR/RF with existing RCWD wells located down gradient. Once pumped out of the ground, this water will be disinfected and delivered to customers. Thus, all of the 5,417 AFY placed into the spreading basin will ultimately be used by RCWD's customers. This would equate to 270,850 AF over the 50-year life of the Project.

The use of untreated in-lieu of treated imported supply contributes to the overall sustainability of the RCWD's groundwater supply by increasing groundwater replenishment and banking, which in turn reduces the risk of short-term water supply shortages.

As noted in **Table 7-13**, the installation of the recovery well and associated facilities will allow RCWD to offset the amount of *treated* imported water required from MWD by 5,417 AFY (or 270,850 AF over the life of the Project). Since untreated water is less expensive than treated water, this project reduces costs associated with MWD water purchases, which provides a financial benefit to the overall cost of water served to customers (see Attachment 8).

Uncertainties

The potential for increased groundwater recharge as a result of implementing the Project is confirmed by the performance of existing recharge operations at the Project site, as well as detailed analysis conducted as part of the *Upper VDC Conjunctive Use Optimization Study Final Report (Optimization Study)*.

The cost of MWD supplies is not determined by RCWD and so there is some level of uncertainly relative to the potential for cost savings given the projected difference in MWD's treated and untreated (raw) rates (See **Appendix F**).

Potential Adverse Effects

There are no potential adverse physical effects that could be determined as a result of Project implementation.

Annual Project Physical Benefits

The following **Tables 7-14 and 7-15** present the physically quantifiable benefits for the Project.

Table 7-14: Annual Water Supply Reliability Benefit: Increased Basin Recharge and Recovery

Type of Benefit Claimed: Increased basin recharge and recovery **Measure of Benefit Claimed (Name of Units):** AFY **Additional Information About this Measure:** over the average year			
Physical Benefits (AFY)			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2013-2017	0	Not applicable	Not applicable
2018-2066	0	5,417	5,417
Comments: *Benefits would be realized upon completion of construction related activities and permitting beginning in 2018*			

Table 7-15: Water Supply Reliability Benefit: Treated Imported Water Offset

Type of Benefit Claimed: Treated imported water offset **Measure of Benefit Claimed (Name of Units):** AFY **Additional Information About this Measure:** over the average year			
Physical Benefits (AFY)			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2013-2017	0	Not applicable	Not applicable
2018-2066	0	5,417	5,417
References: *Benefits would be realized upon completion of construction related activities and permitting beginning in 2018*			